DOCUMENT RESUME

ED 226 461 EA 015 406

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TITLE Cognitive Profile: Increasing Student Performance.
PUB DATE Nov 82
NOTE 11p.; Paper presented at the National Association of Secondary School Principals Institute (Nashville, TN, November 11-13, 1982).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Academic Achievement; Achievement Gains; Cognitive Ability; *Cognitive Measurement; *Cognitive Processes; Elementary Education; Mothers; Parent Influence; *Remedial Instruction; *Student Characteristics
IDENTIFIERS Cognitive Controls

ABSTRACT

Past and ongoing research on cognition indicates that its effects on academic achievement are more direct than those of environmental, affective, or behavioral factors. The research has analyzed cognitive factors, the remediation of cognitive differences, and the transferability of remediation practices. Other cognition researchers have focused on single dimensions of cognitive controls--that is, people's information processing habits. The present researchers instead have focused on seven cognitive control dimensions, including reflective-impulsive, scanning, analytic/global, breadth of category, tolerance for ambiguity, leveling/sharpening, and complexity. By constructing a "cognitive profile" based on bipolar aspects of the seven dimensions, the researchers identified three types of cognitive profiles and found that the types differentiated students by grade level and also predicted achievement and allowed the tracking of grade-level differences through time. Studies of experimental and control groups from the two lower profile types suggest that strategies and materials can remediate cognitive problems and move students into the top cognitive profile type. Other studies indicate that mothers' cognitive profiles are related to those of their children below age 6 but not for those above age 8. (RW)

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Cognitive Profile: Increasing Student Performance

Paper for Presentation at:

NASSP Institute

November 11-13, 1982

Nashville, Tennessee

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ABSTRACT

Most areas of educational research have only an indirect relationship to the process of learning, whereas the study of Cognition provides a direct link not only to the learning process itself, but to remediation and generalization procedures.

Specifically, research in Cognitive Controls and Profiles have demonstrated a significant ($p < .01$) relationship to academic achievement from grades one through eight. In addition, remediation of deficit Cognitive Controls has led to an average increase of 3.65 grade levels in standardized testing results.

Cross-sectional data reveals that a Type 1 Cognitive Profile is related to superior academic achievement from first to eighth grade, while Type 2 Profiles demonstrate average performance and Type 3 Profiles display below grade norm achievement for the same period. By the eighth grade, an eight to nine grade differential separate a Type 1 and Type 3 Profile.

Related research indicates a significant ($p < .05$) relationship between a mother's Cognitive Profile and that of her child under six years old.

Cognitive Control and Profile research has demonstrated important implications for educational procedures and must be accounted for when providing direction and assistance to the optimal development of children.

INTRODUCTION

How to improve the academic achievement of all children has been the question at the center of most educational research efforts.

In the last twenty years we have had an almost exponential increase in both the type and amount of research efforts directed toward the resolution of this question. These efforts have been generally divided into four main areas related to learning:

1. The Environment
2. Affective Domain
3. Behavioral Studies
4. Cognitive Factors

The first three of these approaches have been tried alone or in some combination with varying degrees of limited success. This is so because they only indirectly address the question of learning itself. That is, they attempt to manipulate or direct those external factors that might prove conducive to learning but are not directed at the learning (Cognitive) process itself. Of these four areas, only that of cognition addresses the problem of learning directly. In addition, cognition is the only area that provides a link to remediation and improvement of learning procedures that are significantly related to academic achievement and provide a basis for generalization of effect.

The environment, general behavior patterns, and affective elements are important, surely, but researchers must move beyond these elements and address the learner and how he learns before they can significantly improve achievement for all children.

Our research efforts, over the past several years, in the area of cognition, in particular, Cognitive Controls have been a step in that

direction. These efforts have been concerned with three primary questions:

1. What cognitive factors can reliably measure and describe the differences in levels of academic achievement between various individuals?
2. Is it possible to remediate, through training, certain of these cognitive differences found to be associated with below grade level achievement?
3. Can these remediated controls be transferred and generalized to certain areas of academic achievement?

The research, to date, has provided satisfying answers to these questions.

COGNITIVE CONTROLS

First, however, operational definitions of Cognitive Controls seem to be in order. Cognitive Controls are information processing habits which tend to function across a variety of content areas (Messick, 1970). They are ways of achieving intellectual goals which are general enough to be characteristic of a large segment of one's individual activity and to distinguish that individual from other individuals in search of the same goals (Bourne, 1971). The various dimensions of Cognitive Control constitute the unique mode of intellectual operation that an individual employs when attempting to learn, that is, these Controls are descriptive of how an individual learns.

The majority of recent research efforts has been concerned with the correlations between one dimension of Cognitive Control and other variables such as personality traits or sub-test or standardized tests. However, this unidimensional approach of relating one or two measures of Cognitive Control to other variables (Santostefano, 1978) does not provide the in-

vestigator with a complete picture of the cognitive processes being employed in a given intellectual task (Letteri, 1976).

In addition, this prevailing research strategy fails to provide some organizing principle (Santostefano, 1978) by which to understand the relationship that might exist among various cognitive dimensions, nor can it provide information relating the combine impact of a configuration of cognitive dimensions (Cognitive Profile) on various criterion variables. An emphasis on studies employing measures of several controls related to academic variables should provide new resolution to these research matters.

COGNITIVE PROFILES

Reviews of the literature and instrumentation led to the selection of seven Cognitive Controls: Reflective/Impulsive; Scanning; Analytic/Global; Breadth of Category; Tolerance for Ambiguity; Leveling/Sharpening; Complexity. The selection was based on validity, reliability and correlations to various areas of academic achievement. However, individually they lacked good generalizability across all areas of academic achievement. Research needed a battery of instruments that would reliably and validly describe and predict levels of achievement across all areas of academics for all children in all grades. The seven bi-polar dimensions of the Cognitive Profile is such a battery.

COGNITIVE PROFILES: ACADEMIC ACHIEVEMENT

By employing the seven bi-polar dimensions in several research projects (n-525, grades K to 16+), three specific types of Cognitive Profiles were discovered. As an example, when applied to a sample of seventh and eighth grade children, the Cognitive Profile can significantly differentiate ($p < .01$ or better) subjects into superior academic achievers (up to

four grade levels above peers) a Type 1 Cognitive Profile; average academic achievers (within one grade level of peers), a Type 2 Cognitive Profile; and those who fail to meet grade level achievement (up to five grade levels below peers), a Type 3 Cognitive Profile.

In addition, these profiles can predict academic achievement across all subject areas at a level of $p < .05$ or better and can account for between .62 and .87 (R^2) ($p < .05$ and better) of achievement score variance in all areas of standardized testing (Letteri, 1980).

Cross-sectional data (n-250, grades one to eight) reveal that while there is a difference between Type 1 and Type 3, children beginning in the first grade (.75 to 1 grade level) the magnitude of the difference does not reach serious proportions until the fourth grade where it is approximately two grade levels difference between the Type 1 and Type 3 child. This magnitude of difference continues to grow until the eighth grade where the differences between a Type 1 and Type 3 child can be as much as eight and nine grade levels. This finding is true without exception for all Type 1, 2 and 3 children. Basically, all Type 1 children have been superior academic achievers without exception, Type 2 children are on or within one grade level of the grade norm and Type 3 children all fail to achieve grade level norms in all areas of standardized testing (Letteri, 1981).

Since the profile allows accurate descriptions and predications of Cognitive processes applicable to academic achievement, we decided to attempt to remediate Type 2 and Type 3 children and determine the effect on their levels of academic achievement.

COGNITIVE PROFILE: REMEDIATION

Following, and modeling after, examples in the literature (Debus, 1970; Kagan Pearson and Welch, 1966; Siegleman, 1969) materials and strategies were developed for each of the seven dimensions of the Cognitive Profile. The purpose of these strategies was to train the individual in those areas of the Cognitive Profile shown to be deficit and assist the individual to transfer these new strategies to all areas of academic achievement. In a controlled study (n=30) the experimental group (n=10) met with a trained remediator for one hour sessions, twice a week for fifteen weeks. These training and transfer sessions were carried out in the child's school. The control group (n=20) identified as having same type profiles, followed their normal daily routine. During this time, the experimental group was assisted in transferring their new strategies to the area of math. This was due to the limited amount of time afforded to work with these children and the experimental nature of the procedures. All children were re-tested at the end of the fifteen weeks in the seven dimensions of the profile.

As expected, the experimental group did show significant gains and all displayed Type 1 Profiles. The control groups showed no change in their Cognitive Profile types. Following a six month hiatus, all children in the study were administered standardized tests by the local schools (MAT). The experimental group showed an average gain of 3.65 grade levels in the area of math, while the control group had an average gain of .75 grade levels in math. This study, while small, at least indicated that profiles can be changed, that transfer to academic areas can be achieved, and that the training and transfer strategies will maintain themselves

for at least a six month follow-up. Since this time, fifteen case studies have been completed with the intent of improving the materials and strategies for both the training and the transfer procedures.

In a current study of six case studies (ranging from third grade to seventh grade), following ten weeks (twenty hours of training), an average improvement of two grade points has been demonstrated. Grade point averages are determined by assigning the following grade weight: F-0; D-1; C-2; B-3; A-4. This improvement is measured by teacher-made tests since standardized tests are administered only once a year by local schools. Unfortunately, a lack of financial support has curtailed our ability to carry out additional large sample controlled studies.

COGNITIVE PROFILE: A LEARNED PROCESS

In a related study (Kuntz and Letteri, 1981), it was reported that there is a significant correlation ($p < .05$) between a mother's Cognitive Profile scores and those of her children under six years old, whereas there was no significant relationship between a mother's Cognitive Profile and children older than eight years old. These results not only give a further support to the literature on early maternal influences on the child, but also offer insight as to what these influences might be. The mothers may be transferring to a pre-school child the benefits and limitations of her own cognitive resources. A further question posed by this research conerns verbal and non-verbal communications between mother and child. Using Chomsky's model of language acquisition, is it possible that the deep structure of language carries more than meanings of the surface structure? Is it possible that this deep structure also carries messages related to how to process data? How to scan, focus, compare

data? The answer could have direct implications for child care in the home and institutions such as day care centers. It might also have implications for the selections of personnel employed at these centers.

CONCLUSION

The Cognitive Profile of a child is the central core of his learning capabilities. These Cognitive Profiles determine how a child learns, have impact on what he learns, and ultimately, shape how the individual responds, adapts to all environmental influences.

If we are to address the question of optimal development for all children, perhaps we should start by assuring they have appropriate Cognitive Profiles to give direction and force to their own development while providing the basis for skillful adaptation to, or making changes in, their environments.

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